PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

TAKAGUCHI et al

Application No.: 10/573,449 Art Unit: 1793

Filing date: January 19, 2007 Examiner: Megha Mehta

For: WAVE SOLDERING TANK

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, Charles Garris, declare as follows:

My background and experience in connection with turbomachinery are set forth in my previous declaration of August 17, 2010.

In my previous declaration, I discussed factors relevant to the design of a screw pump, and I compared a single-blade pump with a multiple-blade pump. In this declaration, I would like to discuss a number of statements which were made in the Official Action of September 22, 2010 in connection with the present application. Below, I have referred to these statements as Statements 1 - 4

Discussion of Statement 1

Page 3, lines 2 - 4 of the Official Action contains the following statement:

> However, just because Gerstenberg uses his pump for particularly viscous materials does not mean that Gerstenberg's pump wouldn't be used for less viscous materials.

As a person with considerable experience in the design of pumps, I believe the above statement to be incorrect. A designer of pumps considers the viscosity of the fluid being handled (the working fluid) to be highly relevant when deciding whether a certain type of pump should be used. The viscosity of the working fluid has a great influence on the operation of a pump, and this is reflected by the fact that some pumps are considered by engineers to be inappropriate for certain fluids. For example, screw pumps are considered appropriate for highly viscous fluids, while they are considered much less suitable for low viscosity fluids. Lubricating oil and hydraulic fluids, which are high viscosity fluids, are frequently pumped using screw pumps but would not be pumped using a centrifugal pump. On the other hand, a water pump for an automobile is almost always a centrifugal pump and is virtually never a screw pump due to the low viscosity of water. The fact that the working fluid in the Gerstenberg reference (U.S. Patent No. 7,165,933) is a highly viscous material while molten solder is a very low viscous material is a major reason I would not consider the pump disclosed in Gerstenberg to necessarily be suitable for pumping molten solder.

Discussion of Statement 2

Page 3, lines 4 - 7 of the Official Action contains the following statement:

Further, Professor Garris admits that it is not clear for what reason Gerstenberg has multiple blades (Declaration page 5, first paragraph). Thus, it is not unreasonable to assume that a multiple blade pump would be capable of effectively pumping lower viscosity fluids as well.

As an initial matter, on page 5, line 1 of my previous declaration, I wrote that "Gerstenberg does not say why the most preferred number of blades is 2 - 5." I do not consider this statement to be any sort of admission but simply a statement of fact. Gerstenberg does not give any reason why multiple blades are preferred to a single blade, and to say why Gerstenberg prefers multiple blades to a single blade would require the ability to read the mind of Gerstenberg.

As a second matter, the statement in the Official Action that "it is not unreasonable to assume that a multiple blade pump would be capable of effectively pumping lower viscosity fluids as well" is at odds with the above statement that the viscosity of a fluid is highly relevant to the design of a pump. There is no reason to expect that a pump intended for a high viscosity fluid, like the working fluids in Gerstenberg, is necessarily appropriate for a low viscosity fluid, such as molten solder.

Returning to the issue of Gerstenberg's reason for stating that the number of screw blades is most preferably 2 - 5 (column 3, line 67), since Gerstenberg does not provide any experimental data, it is impossible to say what feature of multiple blades Gerstenberg considered to be superior to a single blade. However, as a person with significant experience in the design of turbomachinery, I believe that the most likely reason that Gerstenberg employs multiple blades is related to increasing the ability to cool the working fluid as it is being pumped. Gerstenberg repeatedly states that it is important to avoid temperature damage to an emulsion, which is the working fluid in Gerstenberg. For example, lines 9 - 11 of the Abstract of Gerstenberg state that a screw pump according to the invention of Gerstenberg "is suitable for pumping emulsion susceptible to mechanical or temperature damage". Column 1, lines 63 - 65 state that "In particular influence on the emulsions by excessive pressure and temperature have to be avoided". Column 2, lines 48 - 52 state that "Further the jacket (4) surrounding the cylindrical housing and the means for supply or removal of heat inside the rotor (9) ensures that the temperature of the product may be kept within narrow limits during the transport ...". In order to control the temperature of the emulsion, Gerstenberg provides a jacket (4) for supply or removal of heat using a heat transfer medium such as water, as well as a channel inside a rotor (9) through which a heat transfer medium can flow.

From the standpoint of more effectively controlling the temperature of an emulsion during pumping, it is advantageous for the pump disclosed in Gerstenberg to employ multiple blades rather than a single blade. The screw blades (11) of Gerstenberg are secured to the rotor (9) and are therefore cooled or heated by conduction of heat between the rotor (9) and the blades (11). The larger the number of blades (11), the greater is the surface area for heat transfer between the emulsion and the blades (11), and the better can the temperature of the emulsion be controlled.

Providing heat transfer between the blades of a pump and the working fluid is not a consideration in a pump for molten solder. On the contrary, rather than wanting to remove heat from the molten solder passing through a pump, one would want to minimize cooling of the molten solder.

Therefore, what I believe to be the most likely reason why Gerstenberg states that the most preferred number of screw blades is 2 - 5 would not be relevant to a designer of a pump for molten solder.

Discussion of Statement 3

Page 5 of the Official Action contains the following statement:

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include the multiple-blade screw pump with at least four helical blades of Gerstenberg in the method of Kabe because the multiple-blade pump more efficiently and effectively transports the viscous liquid than would a single-blade

pump".

As I explained on page 2 of my previous declaration, there is no necessary correlation between the efficiency and effectiveness of a pump and the number of blades. As stated in my previous declaration, in a given application, it is difficult to predict the number of vanes, and the optimal number of helix turns, for optimal flow induction without extensive experimentation. Therefore, no one skilled in the art could say, simply by looking at the pump disclosed in Gerstenberg, that this pump would be suitable for pumping molten solder and that a multiple blade pump would be superior to a single blade pump for pumping solder.

Discussion of Statement 4

The bottom of page 8 of the Official Action contains the following statement:

> "It would not be unreasonable to expect one of ordinary skill in the art at the time the invention was made to look to Gerstenberg to improve the pumping functions of solder tank impellers. More blades means that each blade has to do less work. It naturally follows that the pumping action would be improved".

I am not familiar with any theory that the efficiency of a pump necessarily increases as the number of blades increases. If this were the case, every screw pump would have as many blades as could be crammed into the pump chamber, but experience tells us that this is not the case. The pump motor does not know the "amount of work" being performed by each blade of a screw pump. The load applied to the pump motor is the sum of the loads applied to all of the blades,

and dividing the load applied to the working fluid among a larger number of blades does not necessarily result in a higher efficiency.

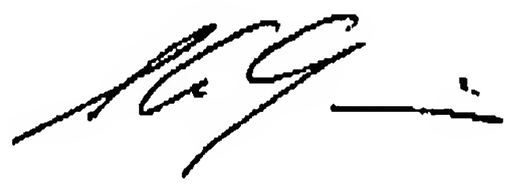
It is not clear how the Official Action is defining "pumping action". A designer of pumps might refer to the "performance" of a pump, but the meaning of this term will depend upon the context, as there is no single metric of pump performance. Whether a pump can be described as having good "performance" depends upon the objective of the user of the pump. In the case of Gerstenberg, a pump having good performance is one which can gently transport an emulsion without mechanical or thermal damage. In contrast, the English abstract of JP 62-259665, which I discussed in my previous declaration, states that the primary goal of the pump of JP 62-259665 is to "prevent the pressure variation of a molten solder and to stabilize the injection level", which I assume means to stabilize the level of molten solder which is discharged from a nozzle. This is an entirely different goal from that of Gerstenberg, and however well the pump of Gerstenberg may achieve the goal of protecting an emulsion from mechanical or thermal damage would not tell me, as a designer of pumps, that this same pump can achieve the goal of JP 62-259665. Therefore, I believe it incorrect to state increasing the number of blades of a screw pump necessarily improves "pumping action".

Conclusion

Accordingly, as stated on page 5 of my previous declaration, as a person with significant experience in the design of turbomachinery, the fact that Gerstenberg recommends a screw pump having at least 2 blades would not tell me that a similar pump would be suitable as a pump for molten solder, and specifically for the pump shown in JP 62-259665.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Respectfully submitted,



Charles Garris, Jr.

Date: February 26, 2011